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IS 12448-6 (1991): Basic testing procedures and measuring methods of electromechanical components for electronic equipment, Part 6: Climatic tests and soldering tests [LITD 3: Electromechanical COmponents and Mechnical Structures for Electronic Equipment]

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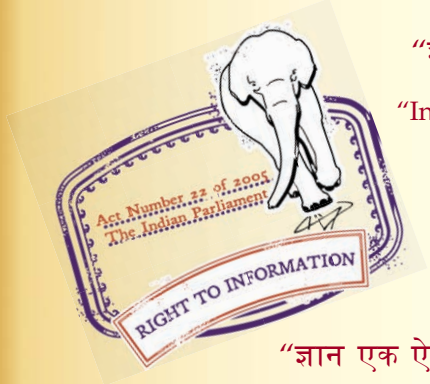

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 12448 (Part 6):1991
(Reaffirmed 2002)

Indian Standard

BASIC TESTING PROCEDURES AND MEASURING METHODS FOR ELECTROMECHANICAL COMPONENTS FOR ELECTRONIC EQUIPMENT

PART 6 CLIMATIC TESTS AND SOLDERING TESTS

UDC 621·38·038 + 621·31 : 620 : 179·2 (621·791·35)

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1991

Price Group 4

FOREWORD

This Indian Standard (Part 6) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by Electronics and Telecommunication Division Council.

The object of this standard (Part 6) is to lay down uniform methods of tests for climatic and soldering tests on electromechanical components.

This standard (Part 6) is based, without any technical change on IEC Pub. 512-6 (1977) 'Electromechanical components for electronic equipment, basic testing procedures and measuring methods : Part 6 Climatic tests and soldering tests', issued by the International Electrotechnical Commission (IEC).

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

BASIC TESTING PROCEDURES AND MEASURING METHODS FOR ELECTROMECHANICAL COMPONENTS FOR ELECTRONIC EQUIPMENT

PART 6 CLIMATIC TESTS AND SOLDERING TESTS

1 SCOPE

1.1 This standard (Part 6) covers test methods for climatic tests and soldering tests of electromechanical components.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

SECTION ONE — CLIMATIC TEST

3 TEST 11a : CLIMATIC SEQUENCE

3.0 General

The object of this test is to detail a standard test method to assess the ability of a component to function in a specified manner in a specified environment which might be encountered during normal use including storage.

3.1 Preparation of the Specimen

3.1.1 *Mechanical Preparation*

The specimen shall be equipped with normal accessories, mounted and wired according to the detail specification. When required by the detail specification, the specimen shall be operated the number of times specified prior to the test. For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated, mated or unmated.

3.1.2 *Preconditioning*

Preconditioning shall be carried out in accordance with the detail specification.

3.2 Test Method

3.2.1 *Initial Measurements*

Initial measurements shall be carried out in accordance with the detail specification.

3.2.2 *Dry Heat*

3.2.2.1 This test shall be carried out in accordance with Test 11i (*see* **11**) using the appropriate degree of severity.

3.2.2.2 The specimen shall be exposed to the specified temperature for a period of 16 hours. At the end of this period and while still at high temperature, the insulation resistance shall be measured in accordance with Test 3A of IS 12448 (Part 2/Sec 3) : 1988 and therein shall be not less than the value specified.

3.2.2.3 The specimen shall be then allowed to recover to standard conditions as specified in Test 11i (*see* **11**).

3.2.3 *Damp Heat, Accelerated : First Cycle*

3.2.3.1 This test shall be carried out in accordance with Test 11c (*see* **5**) using the specified degree of severity.

3.2.3.2 The specimen shall then be subjected to this test for one cycle of 24 hours.

3.2.3.3 The specimen shall then be exposed to standard recovery conditions as specified in Test 11c (*see* **5**).

3.2.4 *Cold*

3.2.4.1 This test shall be carried out in accordance with Test 11j (*see* **12**) using the specified degree of severity.

3.2.4.2 The specimen shall be exposed to the specified temperature for 2 hours.

3.2.4.3 The specimen shall then be exposed to standard recovery conditions as specified in Test 11j (*see* **12**).

3.2.4.4 The specimen shall then be visually inspected and shall show no sign of deterioration.

3.2.5 *Low Air Pressure*

3.2.5.1 This test shall be carried out in accordance with Test 11k (*see* **13**) using the specified degree of severity.

3.2.5.2 The duration of the test shall be 5 min unless otherwise specified.

3.2.5.3 During this test, Tests 4a and 4b of IS 12448 (Part 2/Sec 4) : 1988 shall be carried out where specified.

3.2.5.4 During and after this test, there shall be no sign of glow discharge, breakdown, flashover or harmful deterioration of the specimen.

3.2.6 *Damp Heat, Accelerated, Remaining Cycle(s).*

3.2.6.1 This test shall be carried out in accordance with Test 11c (*see* 5) using the specified degree of severity.

3.2.6.2 The specimen shall be subjected to this test for the remaining number of cycles.

3.2.6.3 The specimen shall then be exposed to standard recovery conditions as specified in Test 11c (*see* 5).

3.3 Final Measurements

The specimen shall then be subjected to the following tests as described in the different parts of IS 12448 and shall meet the requirements specified therein:

a) Insulation resistance (Test 3a);

b) Voltage proof (Test 4a);

c) Contact resistance tests, as specified in the detail specification (Test 2);

d) Mechanical operating tests (Test 13) as applicable;

e) Cable clamping tests, as applicable (Test 17); and

f) Visual examination as applicable (Test 1a).

NOTES

1 The first two tests shall be carried out immediately following the final recovery period.

2 The specimen shall not be disturbed out prior to the first measurement of contact resistance after exposure.

3 When required by the detail specification, the specimen shall be operated three times and then tested for electrical continuity and contact resistance.

3.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of mounting and wiring the specimen and operated condition of the component(s), if applicable;

b) Preconditioning time;

c) Initial measurements and requirements;

d) Severity of each step of the climatic sequence;

e) Minimum value of the insulation resistance at high temperature;

f) When the low air pressure test is applicable, the test(s) to be used and the value of the test voltage;

g) When the contact resistance test is applicable, the test to be used;

h) Requirements for the final measurements;

j) Applicable operational characteristics; and

k) Any deviation from the standard test method.

4 TEST 11b: COMBINED/SEQUENTIAL COLD, LOW AIR PRESSURE AND DAMP HEAT

Under consideration.

5 TEST 11c: DAMP HEAT, STEADY STATE

5.0 General

The object of this test is to detail a standard test method to assess the ability of a component to be stored and/or to function in a specified manner under conditions of high relative humidity.

5.1 Preparation of the Specimen

5.1.1 *Mechanical Preparation*

The specimen shall be equipped with normal accessories, mounted and wired according to the detail specification.

When required by the detail specification, the specimen shall be operated the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated, mated or unmated.

5.1.2 *Preconditioning*

Preconditioning shall be carried out in accordance with the requirements of the detail specification.

5.2 Test Method

5.2.1 *Initial Measurements*

When required by the detail specification, the specified initial measurements shall be made under standard atmospheric conditions immediately after preconditioning.

5.2.2 *Conditioning*

Damp heat, steady state, shall be applied in accordance with Test 11c (*see* 5) using the specified degree of severity.

5.2.2.1 *Polarization voltage*

When specified in the detail specification, a polarization voltage shall be applied to two of the specimens during conditioning. These specimens shall be wired, alternate terminations shall be connected together to form two groups.

On specimen No. 1, the polarization voltage shall be applied across the first group of terminations and the second group connected to the housing (shell) and/or the mounting plate. On specimen No. 2, the polarization voltage shall be applied across the second group of

terminations and the first group connected to the housing (shell) and/or the mounting plate.

In the case of rotary switches, the points of application of the polarizing voltage shall be as specified in the detail specification.

5.3 Final Measurements

The specimen shall then be subjected to the following tests as described in the different parts of IS 12448 and shall meet the requirements specified by the detail specification:

a) Insulation resistance (Test 3a);
b) Voltage proof (Test 4a);
c) Contact resistance tests (Test 2) as applicable;
d) Mechanical operating tests (Test 13) as applicable; and
e) Visual examination (Test la).

NOTES

1 The first two tests shall be carried out immediately, following the final recovery period.

2 When required by the detail specification, measurement a) may be made while the specimen is still in the test chamber.

3 The specimen shall not be disturbed prior to the first measurement of contact resistance after exposure.

4 When required by the detail specification, the specimen shall be operated three times and then tested for electrical continuity and contact resistance.

5.4 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

a) Method of mounting and wiring the specimen;
b) Operated condition of the specimen;
c) Preconditioning time and number of operations, if applicable;
d) Degree of severity of Test 11c (*see* **5**);
e) Value of the polarizing voltage and, in the case of rotary switches the points of application;
f) Initial measurements and requirements;
g) Contact resistance test to be used;
h) Contacts between which Tests 3 and 4 are to be carried out;
j) Measurements during conditioning, if applicable;
k) Mechanical operating test(s) to be used;
m) Requirements for the final measurements; and
n) Any deviation from the standard test method.

6 TEST 11d: RAPID CHANGE OF TEMPERATURE

6.0 General

The object of this test is to detail a standard test method to assess the ability of a component to withstand rapid changes of temperature in air such as might occur during storage, transportation and use.

6.1 Preparation of the Specimen

6.1.1 *Mechanical Preparation*

The specimen shall be equipped with normal accessories, mounted and wired according to the detail specification.

When required by the detail specification, the specimen shall be operated the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example operated or non-operated, mated or unmated.

6.1.2 *Preconditioning*

Preconditioning shall be carried out in accordance with the requirements of the detail specification.

6.2 Test Method

6.2.1 *Initial Measurements*

When required by the detail specification, the specified initial measurements shall be made under standard atmospheric conditions immediately after preconditioning.

6.2.2 *Conditioning*

This test shall be carried out in accordance with IS 9000 (Part 14/Sec 1): 1988

The period of exposure and the number of cycles of both high and low temperature shall be specified in the detail specification.

6.3 Final Measurements

The specimen shall then be subjected to the following tests as described in the different parts of IS 12448 and shall meet the requirements specified by the detail specification:

a) Voltage proof (Test 4a);
b) Insulation resistance (Test 3a);
c) Visual examination (Test 1a); and
d) Operational characteristics.

6.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of mounting and wiring the specimen;
b) Preconditioning time and number of operations, if applicable;
c) Severity of conditioning;
d) Initial measurements and requirements;

e) Operated condition of the specimen during test;
f) Recovery time;
g) Final measurements and requirements; and
h) Any deviation from the standard test method.

7 TEST 11e: MOULD GROWTH

7.0 General

The object of this test is to detail a standard test method to assess the extent and the effect on the functioning of a component submitted to a mould culture.

7.1 Preparation of the Specimen

The specimen shall be mounted according to the detail specification.

When required by the detail specification, the specimen shall be operated the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated, mated or unmated.

7.2 Initial Measurements

The insulation resistance shall be measured in accordance with Test 3a of IS 12448 (Part 2/ Sec 3) : 1988. The required values shall be stated in the detail specification.

7.3 Test Method

This test shall be carried out in accordance with IS 9000 (Part 10) : 1979. The duration of the test shall be stated in the detail specification.

7.4 Final Measurements

The specimen shall then be subjected to the following tests as described in the different parts of IS 12448 and shall meet the requirements specified by the detail specification:

a) Insulation resistance (Test 3a), and
b) Visual examination (Test 1a).

7.5 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of mounting the specimen;
b) Operated condition;
c) Initial measurements and requirements;
d) Duration of the test;
e) Requirements for final measurements; and
f) Any deviation from the standard test method.

8 TEST 11f: CORROSION, SALT MIST

8.0 General

The object of this test is to detail a standard test method to assess the effects of a controlled salt-laden atmosphere on the finish of the specimen. It is not intended to be followed by electrical tests. However, when required by the detail specification, this test may be followed by Test 9a: Mechanical operation (endurance), as described in IS 12448 (Part 5/Sec 4): 1989 to assess the effect on the mechanical functioning of the specimen.

8.1 Preparation of the Specimen

The specimen shall be prepared and mounted according to the detail specification.

When required by the detail specification, the specimen shall be operated the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated, mated or unmated.

8.2 Test Method

This test shall be carried out in accordance with IS 9000 (Part 11) : 1983 Test Salt mist.

8.3 Final Examination

Upon completion of the above test and after the specimen has been washed with distilled water and dried as specified, it shall be visually examined in accordance with Test 1a of IS 12448 (Part 2/Sec 1): 1988 with particular attention to the following details:

a) Cracking;
b) Delamination; and
c) Pitting of exposed metal surfaces.

8.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of preparation, mounting and attitude of the specimen;
b) Duration of the exposure;
c) Requirements; and
d) Any deviation from the standard test method.

9 TEST 11g: CORROSION INDUSTRIAL ATMOSPHERE

In preparation.

10 TEST 11h: SAND AND DUST

In preparation.

11 TEST 11i: DRY HEAT

11.0 General

The object of this test is to detail a standard test method to assess the ability of a component to be stored and to function in a specified manner under specified conditions of dry heat.

11.1 Preparation of the Specimen

11.1.1 *Mechanical Preparation*

The specimen shall be equipped with normal accessories, mounted and wired according to the detail specification.

When required by the detail specification, the specimen shall be operated the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated, mated or unmated.

11.2 Preconditioning

Preconditioning shall be carried out in accordance with the requirements of the detail specification.

11.2 Test Method

11.2.1 *Initial Measurements*

When required by the detail specification, the specified initial measurements shall be made under standard atmospheric conditions immediately after preconditioning.

11.2.2 *Conditioning*

Dry heat shall be applied in accordance with test of IS 9000 (Part 3/Sec 1) : 1977 using the specified degree of severity.

11.3 Final Measurements

When required by the detail specification, the specimen shall be subjected to the following tests, as described in the different parts of IS 12448 and shall meet the requirements specified by the detail specification:

a) Insulation resistance (Test 3a);
b) Voltage proof (Test 4a);
c) Contact resistance tests (Test 2) as applicable;
d) Mechanical operating tests (Test 13) as applicable;
e) Visual examination (Test 1a) as applicable;
f) Static load test (Test 8) as applicable;
g) Insertion retention tests in housing (Test 15) as applicable; and
h) Sealing and leakage tests (Test 14) as applicable.

NOTES

1 The first two tests shall be carried out while the specimen is still at the specified high temperature.

2 The specimen shall not be disturbed prior to the first measurement of contact resistance after exposure.

3 When required by the detail specification, the specimen shall be operated three times and then tested for electrical continuity and contact resistance.

11.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of mounting and wiring the specimen;
b) Preconditioning, if required;
c) Degree of severity;
d) Operated condition, if applicable;
e) Initial measurements and requirements;
f) Contact resistance test to be used;
g) Mechanical operating tests to be used;
h) Methods and requirements for final measurements; and
j) Any deviation from the standard test method.

12 TEST 11j: COLD

12.0 General

The object of this test is to detail a standard test method to assess the ability of a component to be stored and to function in a specified manner under specified conditions of cold.

12.1 Preparation of the Specimen

12.1.1 *Mechanical Preparation*

The specimen shall be equipped with normal accessories, mounted and wired according to the detail specification.

When required by the detail specification, the specimen shall be operated for the number of times specified prior to the test.

For each test carried out, the detail specification shall specify the condition of the component, for example, operated or non-operated mated or unmated.

12.1.2 *Preconditioning*

Preconditioning shall be carried out in accordance with the requirements of the detail specification.

12.2 Test Method

12.2.1 *Initial Measurements*

When required by the detail specification, the specified initial measurements shall be made

under standard atmospheric conditions immediately after preconditioning.

12.2.2 *Conditioning*

Cold test shall be applied in accordance with IS 9000 (Part 2/Sec 1) : 1977 using the specified degree of severity.

12.3 Final Measurements

The specimen shall be subjected to the following tests as described in the different parts of IS 12448 and shall meet the requirements specified by the detail specification:

a) Insulation resistance (Test 3a);

b) Voltage stress tests (Test 4) as applicable;

c) Contact resistance tests (Test 2) as applicable;

d) Mechanical operating tests (Test 3) as applicable;

e) Visual examination (Test 1a) as applicable;

f) Sealing and leakage tests (Test 14) as applicable;

g) Static load tests (Test 8) as applicable; and

h) Insert retention in housing (Test 15) as applicable.

NOTES

1 The first two tests shall be carried out while the specimen is still at the specified low temperature.

2 The specimen shall not be disturbed prior to the first measurement of contact resistance after exposure.

3 When required by the detail specification, the specimen shall be operated three times and then tested for electrical continuity and contact resistance.

12.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Method of mounting and wiring the specimen;

b) Preconditioning, if required;

c) Degree of severity of conditioning;

d) Initial measurements and requirements;

e) Contact resistance test to be used;

f) Methods and requirements for final measurements; and

g) Any deviation from the standard test method.

13 TEST 11k: LOW AIR PRESSURE

13.0 General

The object of this test is to detail a standard test method to assess the ability of a component to operate under conditions of low air pressure, for example, high altitude.

13.1 Preparation of the Specimen

The specimen shall be equipped with normal accessories as specified and shall be wired and mounted according to the detail specification.

The operated condition of the specimen shall be specified by the detail specification.

13.2 Test Method

This test shall be carried out in accordance with IS 9000 (Part 13) : 1981. The severity shall be prescribed in the detail specification. Facility should be provided for the application of any functional checks prescribed in the detail specification.

The chamber shall be sealed.

The chamber pressure shall be reduced from ambient to a value specified by the detail specification, in accordance with IS 9000 (Part 13): 1981 and maintained at that pressure for a minimum of 5 min.

Unless otherwise specified, after this period and while the specimen is still at the prescribed low pressure, the specimen shall be subjected to a voltage proof test in accordance with Test 4a voltage proof of IS 12448 (Part 2/Sec 4) : 1988. The chamber pressure shall then be increased to room ambient within 1 min.

13.3 Final Measurements

When specified in the detail specification the specimen shall be subjected to general examination, Test 1a of IS 12448 (Part 2/Sec 4) : 1988.

13.4 Details to be Specified

When this test is required by the detail specification, the following details shall be given:

a) Preparation of the specimen, including number of contacts to be wired, accessories, type and size of cable/wire bundle to be used, where applicable;

b) Severity;

c) Proof voltage;

d) Operations to be carried out at low air pressure;

e) Minimum period at low pressure if other than 5 min;

f) Requirements for final measurements; and

g) Any deviation from the standard test method.

14 TEST 11m: DAMP HEAT MODERATE SEVERITY

Under consideration.

SECTION TWO — SOLDERING TES TS

Under consideration.

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
9000 (Part 3/ Sec 1) : 1977	Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test, Section 1 General
9000 (Part 10) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 10 Mould growth test
9000 (Part 11) : 1983	Basic environmental testing procedures for electronic and electrical items: Part 11 Salt mist test
9000 (Part 13) : 1981	Basic environmental testing procedures for electronic and electrical items: Low air pressure test
9000 (Part 14/ Sec 1) : 1988	Basic environmental testing procedures for electronic and electrical items: Part 14 Test N: Change of temperature, Section 1 Test Na: Rapid change of temperature (thermal shock) with prescribed time of transition two chamber method (*first revision*)
12448 (Part 2/ Sec 1) : 1988	Basic testing procedures and measuring methods for electromechanical components for electronic equipment: Part 2 General examination, electrical continuity and contact resistance test insulation test and voltage stress test, Section 1 General requirements
12448 (Part 2/ Sec 3) : 1988	Basic testing procedures and measuring methods for electromechanical components for electronic equipment: Part 2 General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests, Section 3 Insulation tests
12448 (Part 2/ Sec 4) : 1988	Basic testing procedures and measuring methods for electromechanical components for electronic equipment: Part 2 General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests, Section 4 Voltage stress tests
12448 (Part 5/ Sec 4) : 1989	Basic testing procedures and measuring methods for electromechanical components for electronic equipment: Part 5 Impact tests (free components) endurance tests and overload tests, Section 4 Over load test

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